Amendments to the Specification:

Replace the second paragraph of the "Summary of the Invention" with the following new paragraphs:

~~According to the present invention, an apparatus for measuring at least one parameter of a mixture flowing through a pipe is provided. The apparatus includes a pair of ultrasonic transducers disposed axially along the pipe for measuring the transit time of an ultrasonic signal to propagate from one ultrasonic transducer to the other ultrasonic transducer. A processor, responsive to said transit time signal, provides an output signal indicative of the at least one parameter of the mixture flowing through the pipe.~~

An apparatus for measuring the composition of a mixture flowing through a pipe includes an ultrasonic sensor apparatus disposed along the pipe. The ultrasonic sensor transmits an ultrasonic signal through the mixture and receives the ultrasonic signal, to provide a measured signal indicative of the transit time of the ultrasonic signal through the mixture. The mixture includes particles suspended within a fluid. A processor, responsive to said measured signal, determines the speed of sound propagating through the mixture. Further the processor, responsive to the speed of sound, determines an output signal indicative of the composition of the mixture flowing through the pipe by determining the speed of sound propagating through the mixture as a function of frequency to characterize dispersion properties of the mixture and comparing the dispersion properties of the mixture to a dispersion model of the mixture.

An apparatus for measuring the composition of a mixture flowing through a pipe includes an ultrasonic sensor apparatus disposed along the pipe that transmits an ultrasonic signal through the mixture and receives the ultrasonic signal. The ultrasonic sensor apparatus provides a measured signal indicative of the transit time of the ultrasonic signal through the mixture. The mixture includes particles suspended within a fluid. A processor, responsive to said measured signal, determines the speed of sound propagating through the mixture. Further the processor, responsive to the speed of sound, determines an output signal indicative of the composition of the mixture flowing through the pipe using a dispersion model, wherein the dispersion model is:

$$a_{mix}(\omega) = a_f \sqrt{\frac{1}{1+\frac{\varphi_p \rho_p}{\rho_f\left(1+\omega^2\frac{\rho_p^2 v_p^2}{K^2}\right)}}}$$

wherein a_{mix} is the speed of sound propagating through the mixture, a_f is the speed of sound propagating through the fluid, K is a proportionality constant, ω is frequency in rad/sec, ϕ_p is the volumetric phase fraction of the particles, ρ_p is the density of the particles, v_p is the volume of individual particles, and ρ_f is the density of the fluid.

An apparatus for measuring the composition of a mixture flowing through a pipe includes an ultrasonic sensor apparatus disposed along the pipe. The ultrasonic apparatus transmits an ultrasonic signal through the mixture and receives the ultrasonic signal, to provide a measured signal indicative of the transit time of the ultrasonic signal through the mixture. The mixture includes particles suspended within a fluid. A processor, responsive to said measured signal, determines the speed of sound propagating through the mixture. Further the processor, responsive to the speed of sound, determines an output signal indicative of the composition of the mixture flowing through the pipe using a dispersion model. The processor compares at least a transitional frequency range of the dispersion model to determine the average size of the particles in the mixture.

An apparatus for measuring the composition of a mixture flowing through a pipe includes an ultrasonic sensor apparatus disposed along the pipe that transmits an ultrasonic signal through the mixture and receives the ultrasonic signal, to provide a measured signal indicative of the transit time of the ultrasonic signal through the mixture. The mixture includes particles suspended within a fluid. A processor, responsive to said measured signal, determines the speed of sound propagating through the mixture. Further, the processor, responsive to the speed of sound, determines an output signal indicative of the composition of the mixture flowing through the pipe using a dispersion model. The processor compares at least one of the lower frequency range and the transitional frequency range of the dispersion model to determine the phase fraction of the mixture.

A method for measuring the composition of a mixture in a pipe includes measuring the transit time of an ultrasonic signal propagating through the mixture. The mixture includes particles suspended within a fluid. The method further includes determining the composition of

the mixture by determining the speed of sound propagating through the mixture as a function of frequency, in response to the measured transit time, to characterize dispersion properties of the mixture and comparing the dispersion properties of the mixture to a dispersion model of the mixture.

A method for measuring the composition of a mixture in a pipe includes measuring the transit time of an ultrasonic signal propagating through the mixture. The mixture includes particles suspended within a fluid. The method further includes determining the composition of the mixture by determining the speed of sound propagating through the mixture as a function of frequency, in response to the measured transit time, to characterize dispersion properties of the mixture and comparing the dispersion properties of the mixture to a dispersion model of the mixture.

A method for measuring the composition of a mixture in a pipe includes measuring the transit time of an ultrasonic signal propagating through the mixture. The mixture includes particles suspended within a fluid. The method further includes determining the composition of the mixture by determining the speed of sound propagating through the mixture in response to the measured transit time, and using a dispersion model. The method also includes comparing at least a transitional frequency range of the dispersion model to determine the average size of the particles in the mixture.

A method for measuring the composition of a mixture in a pipe includes measuring the transit time of an ultrasonic signal propagating through the mixture. The mixture includes particles suspended within a fluid. The method further includes determining the composition of the mixture by determining the speed of sound propagating through the mixture in response to the measured transit time, and using a dispersion model. Also the method includes comparing at least one of the lower frequency range and the transitional frequency range of the dispersion model to determine the phase fraction of the mixture.